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## Mesh-wrapping for the treatment of fractured liver—A case report



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## ABSTRACT

**INTRODUCTION:** Major liver trauma is a potentially fatal injury. Management of liver injuries has considerably changed over the past decades with a trend towards a multidisciplinary approach. Most liver injuries can be managed conservatively; however, some cases need operative management.

**PRESENTATION OF CASE:** We present a case of a 73 year old female who underwent laparoscopic cholecystectomy that was complicated by a life-threatening liver fracture and was successfully managed by staged laparotomies and liver mesh-wrapping.

**DISCUSSION:** Mesh wrapping is an effective approach for achieving hemostasis by a tamponading effect. An alternative to liver packing would be the resection of the affected segmented, however this should be assessed based on the extent of the injury as well as on the hemodynamic stability of the patient who, in majority, are hemodynamically compromised. The advantage however of liver wrapping is that there is no need for reoperation to remove the mesh, the hazard of re-bleeding is diminished because the mesh is left in place, and the incidence of septic complications is low. In this case, the mesh was sutured to the diaphragmatic crus as well as to the falciform ligament to secure the mesh on two anchoring points.

**CONCLUSION:** Using an absorbable mesh on a traumatized and fragmented liver appears to be a safe and effective approach to high grade liver injury. The judicious use of cauterization, beaming or suturing to the liver bed to control oozing or bleeding should be advocated in order to avoid this highly morbid complication.

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## 1. Introduction

Management of liver injuries has considerably changed over the past decades with a trend towards a multidisciplinary approach [1,2]. Emphasis is placed on whether the patient is hemodynamically stable or not [3,4] and on the grading of liver injury. While patients who are hemodynamically unstable require emergent operation [5], most liver injuries can be managed conservatively [6–8]. In operative management of liver injuries, peri-hepatic packing is considered a life saving procedure in complex liver injuries [2,9]. However, in case where significant liver injury has occurred resulting in liver parenchymal fragmentation/laceration, packing is not very efficient.

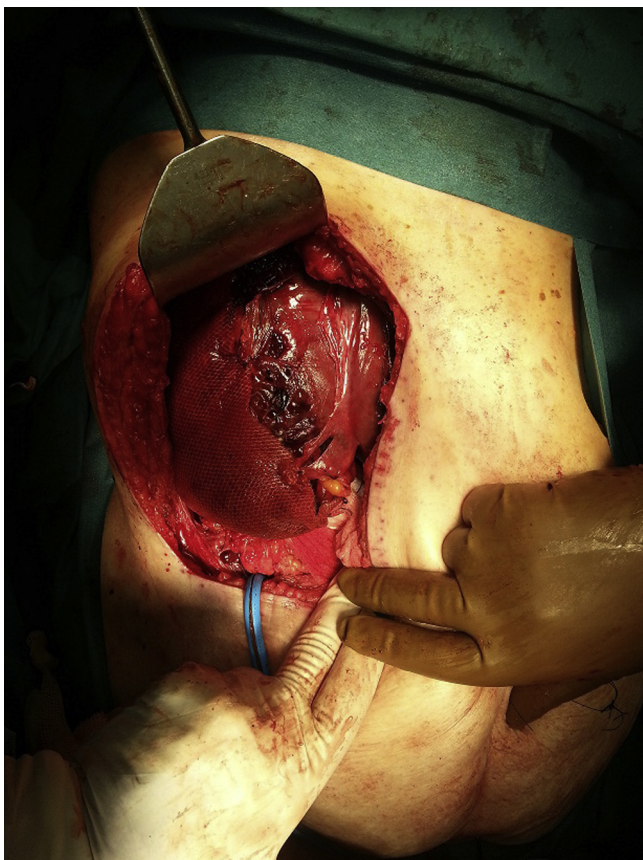
We present a case of a patient who underwent laparoscopic cholecystectomy that was complicated by a life-threatening liver fracture and was successfully managed by staged laparotomies and liver mesh-wrapping.

## 2. Case presentation

Our patient is a 73 year old female who underwent Laparoscopic cholecystectomy for gall stones. The operation was complicated by intra-operative liver bed bleeding which was initially controlled by high beam cauterization, surgicel and some Argon beam. Less than 24 h the patient started to bleed and was hemodynamically unstable requiring multiple blood transfusions. She was re-operated for control of bleeding. Intra-operatively, she was found to have deep fracture in the right lobe reaching the middle hepatic vein. Suturing of the liver was performed using 2-0 vicryl sutures. Patient was transferred to the intensive care unit in a stable condition for close observation. In the ICU, she was stabilized with correction of her acidosis and Hypothermia. Twenty-four hours post surgery the patient was taken again for another control of bleeding. Decision was to wrap the liver with a 10 × 8 inch polyester mesh with collagen barrier (Parietex™ Complex PCO 2520). Multiple Surgicels® and Gel cells were inserted over the liver surface; the mesh was wrapped completely over the right lobe of the liver and was sutured to itself and to the diaphragm surface as well as to the falciform ligament. Care was taken to tightly wrap the mesh in order to exert

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**Fig. 1.** Liver mesh wrapping: a figure showing the right lobe of liver completely wrapped with polyester mesh with collagen barrier.

compression on the liver parenchyma. A reasonable control of the bleeding was achieved. Two pads were inserted in the infra-hepatic area. Two days following the surgery; the patient was taken back to the operating room for removal of packs. She was discharged home after two weeks in good condition.

### 3. Discussion

Major liver trauma is a potentially fatal injury. The primary cause of death is bleeding and can be very difficult to control even in the hand of experienced surgeon [11]. In hemodynamically stable patients, conservative management is considered a safe approach in high grade hepatic injuries [2]. In hemodynamically unstable patients, exploratory laparotomy is warranted but has its own risks. The use of gauze-packing remains an effective method but nevertheless requires a re-intervention for de-packing [12] and may be further complicated by re-bleeding and liver capsule injury (Fig. 1).

Mesh wrapping appears to be an effective approach for achieving hemostasis by a tamponading effect. It was first introduced by Buntain and Lynn for the control of splenic hemorrhage [13]. The use of mesh has also been described during liver transplant following graft injury in pediatric liver trauma [10,14] as well as in adult liver trauma with or without gauze packing [15,16]. However the literature remains scarce.

An alternative to liver packing would be the resection of the affected segment, however this should be assessed based on the extent of the injury as well as on the hemodynamic stability of the patient [15] who, in majority are hemodynamically compromised. The advantage however of liver wrapping is that there is no need for reoperation to remove the mesh, the hazard of re-bleeding is diminished because the mesh is left in place, and the incidence of

septic complications is low [17]. Two important technical steps that have been previously described and are re-emphasized in this case report is the need to wrap the mesh under enough tension to create a tamponade effect and to secure the mesh on two anchoring points [15]. In this case, the mesh was sutured to the diaphragmatic crus as well as to the falciform ligament.

Following mesh application, adequate control of bleeding was achieved. We felt that it was prudent to keep two pads for extra packing given that this was the second revision following the incident, however this required a final re-intervention for de-packing. At the end, the patient was discharged in good condition and no significant morbidity. As for the liver fragmentation, the cause remains unknown. Dellaportas et al. suggested in their report that this might have resulted for suture injury to the right branch of the portal vein followed by dissecting sub-capsular hematoma which ultimately led to fragmentation [15]. This sequence of events might also explain our incidence. The extensive use of cauterization or Argon beam on the liver bed could have injured the right portal branch; however this remains to be proven.

This case represents an addition to the scarce literature on the management of complex liver injury. It may represent an alternative to liver resection or packing. The latter, as previously mentioned, requires re-intervention which may add cost and prolong hospital stay, while resection might lead to liver insufficiency if done in the acute setting. A key point previously described and re-emphasized in this case is that the mesh needs to be anchored with enough tension to provide adequate tamponade, preferably to two anchoring points.

### 4. Conclusion

Using an absorbable mesh on a traumatized and fragmented liver appears to be a safe and effective approach to high grade liver injury. The cause to why these types of injury occur remains unclear, but the judicious use of cauterization, beaming or suturing to the liver bed to control oozing or bleeding should be advocated in order to avoid this highly morbid complication.

### Conflicts of interest

The authors declare no conflict of interest.

### Funding

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### Ethical approval

This is a case report involving one patient and thus does not require IRB approval.

### Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

### Author contribution

Ghassan Chamseddine: data analysis, writing the paper.  
 Mohamed Khalifeh: contributors.  
 Ghattas Khoury: contributors.  
 Jamal Hoballah: contributors.

Ghina El Nounou: data collection.  
 Hussein Nassar: contributors.  
 Walid Faraj: study concept and design..

#### Guarantor

Dr. Walid Faraj.

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The work has been reported in line with the CARE criteria [18].

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